Docket 83448AEK
Customer No. 01333

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

Michael R. Brickey et al

MICROVOIDED LIGHT DIFFUSER

Serial No. 10/017,402

Filed 14 December 2001

Group Art Unit: 2871

Examiner: Chowdhury, Tarifur Rashid

Mail Stop APPEAL BRIEF-PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

Sir:

AMENDED APPEAL BRIEF PURSUANT TO 37 C.F.R. 41.37 AND 35 U.S.C. 134 IN RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

In response to the Notification of Non-compliant Appeal Brief mailed May 10, 2007, submitted herewith is an amended Appeal Brief which corrects the defects noted.

A timely Notice of Appeal was mailed with certificate of first-class mailing November 10, 2006 (with one-month extension of time), and received at the PTO OIPE November 13, 2006. The fee for filing an Appeal Brief was paid on March 8, 2007 and received at the PTO OIPE March 13, 2007.

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Real Party In Interest

The Eastman Kodak Company, is the assignee and real party in interest.

Related Appeals And Interferences

No appeals or interferences are known which will directly affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

Status Of The Claims

Claims 1-9 and 11-25 are pending in the application.
Claims 23-25 are withdrawn.
Claims 1-9 and 11-22 are rejected under 35 USC § 103.
Claims 1-9 and 11-22 are appealed.

Appendix I provides a clean, double-spaced copy of the claims on appeal.

Status Of Amendments

No amendments were filed after Final Rejection.

Summary of Claimed Subject Matter

Independent Claim 1:

With respect to the parts in FIG 1 and the specification (page/line), the invention of claim 1 is directed to a high transmission light diffuser **(12)**. The diffuser comprises a thermoplastic layer having a surface layer **(22)** the layer containing thermoplastic polymeric material **(26)** and microvoids having a substantially circular cross-section **(24)** in a plane perpendicular to the direction of light travel (from the bottom of the page to the top), wherein the thickness of the voided layer and void size and loading are sufficient to provide a diffuser having a diffuse light transmission efficiency of at least 65% (4/10; 5/22-24) and a light transmittance greater than 80% (2/26-28; 7/14-25; 33/15-17).

Pertinent definitions well-known in the art and/or as described in the specification are as follows:

“diffuse light transmission efficiency" (5/22-24) means the ratio of diffuse transmitted (output) light at 500 nm to total transmitted (output) light (specular + diffuse) at 500 nm multiplied by a factor of 100;

“total transmittance” or “percent light transmission” (10/15-26; 33/15-17) means the ratio of total transmitted light divided by the total incident_light multiplied by a factor of 100;

“microvoids”(6/9 et seq.) means pores formed in an oriented polymeric film during stretching. These pores are initiated either by inorganic particles, organic particles, or microbeads. The size of these voids is determined by the size of the particles or microbeads used to initiate the void and by the stretch ratio used to stretch the oriented polymeric film. The pores can range from 0.6 to 150 μm’s in machine and cross machine directions of the film. They can range from 0.2 to 30 micrometers in height. “Void" is used herein to mean devoid of added solid and liquid matter, although it is likely the "voids" contain gas.

Appendix II hereto is an Affidavit of inventor Cheryl Brickey previously submitted and entered providing clear distinctions between the claimed invention and the Ouderkirk disclosure. The invention provides a highly transmissive diffuser that exhibits an improved combination of total light transmission and light diffusion efficiency. Liquid Crystal Displays (LCDs) employ a backlight to produce the observed image. It is desired to have that backlight as diffuse as possible so that the backlight will be hidden from view while at the same time transmitting a high light level to provide a bright image. These two parameters are measured by diffuse light transmission efficiency (for the exiting light, the ratio of diffuse to total light times 100) and light transmission (total light out divided by total light in times 100).

The invention is based on the discovery that the use of a voided layer as a diffuser where the void size and frequency and the film thickness are carefully controlled will provide an improved combination of light transmission and diffuse transmission efficiency. In the present invention, it is not desirable to have light reflected by the film nor is it desirable to have multiple phases of polymeric materials. There is no birefringence required in the invention and no polarization separation is accomplished.

FIG 2 shows how the diffuser (**12**) can be used as part of a backlight system for an LCD display to help even out the light from the backlight (**18**).

Grounds of Rejection to be Reviewed on Appeal

The following issue is presented for review by the Board of Patent Appeals and Interferences:

1. Claims 1-4, 6-7 are rejected in Paragraph 4 of the Final Rejection dated July 11, 2006 under 35 U.S.C. 103(a) over Ouderkirk et al, US 5,825,543.

2. Claims 5, 15-18, and 21-22 are rejected in Paragraph 6 of the Final Rejection under 35 U.S.C. 103(a) over Ouderkirk '543 in view of Aylward, US 6,017,686.

3. Claim 8 is Finally rejected in Paragraph 6 of the Final Rejection under 35 U.S.C. 103(a) over Ouderkirk '543 in view of Wu et al. US 5,346,954,

4. Claim 9 is Finally rejected in Paragraph 6 of the Final Rejection under 35 U.S.C. 103(a) over Ouderkirk '543 in view of Yamamoto et al. US 5,502,011.

Arguments

1. Claims 1-4, 6-7, 11-14, and 19-20 stand rejected in Paragraphs 4 and 5 of the Final Rejection dated July 11, 2006 under 35 U.S.C. 103(a) over Ouderkirk et al, US 5,825,543.

The obviousness rejection of claim 1 pursuant to 35 USC 103 is based entirely on the Ouderkirk et al. reference. The rejection is improper because (1) Ouderkirk et al. is directed to <u>reflective films such as those used in polarizers</u> wherein the diffusers require the presence of two immiscible polymeric phases (not voids). In passages where voids are mentioned, they are said not to be equivalent to the dispersed phase particles of Ouderkirk et al., and are taught away

from by Ouderkirk as added components; they are not suggested to be used to achieve the high transmission/low reflection of the present invention.

(1) The Abstract of Ouderkirk et al. refers to "a disperse phase of polymeric particles disposed within a continuous birefringent matrix". This refers to a layer having particles of one polymer dispersed in an immiscible polymer continuous phase. The pencil-shaped components **(14)** in all of the figures of Ouderkirk are not voids but are discontinuous phase polymeric materials having been stretched along with the film to obtain the elongated shape. See col. 7/line 2 and col. 12/ lines 65 et seq. The components **(14)** are not voids. They are polymeric materials that can be made to match the refractive index of the continuous phase in one direction but not the other by stretching. It is this outcome that necessitates the presence of birefringent materials. The internal portion of a void cannot be adjusted with respect to refractive index by stretching since it is either devoid of material or a gas that cannot be stretched. Further, although voids are made by stretching the film containing particles so that a void forms about the particle, the particles used for voiding do not stretch significantly during the voiding process and thus do not play a role in refractive index control.

The Ouderkirk et al. disclosure is focused on a reflective polarizer. In a conventional absorptive polarizer, the light components polarized parallel to the X axis are transmitted while those polarized parallel to the Y axis are not transmitted. Less than 50% of light is transmitted in this manner by an absorptive polarizer. In a Liquid Crystal Display, a reflective polarizer seeks to diffusely reflect (col. 4/line 27) the un-transmitted light component polarized parallel to the Y axis so that it can then be reflected back to the polarizer with a different orientation with some X component that will be transmitted. Such a use requires a reflective ability of the diffuser. Further Evidence of this objective of the reference is presented in Exhibit II which identifies many portions of the reference where the reflective polarizer is discussed and reflective diffuser is discussed for use therewith.

(2) Ouderkirk et al. mentions the possibility of employing voids, however they are not recommended. Also, there is no teaching of the claim limitations as to the microvoid details of the dependent claims nor is there any

teaching of why one would want to employ these void arrangements. Sections of Ouderkirk where the use of microvoids is discouraged are included in Appendix IV.

Disclosure at col. 11/ line 61 of Ouderkirk et al. talks about Dimensions and Volume Fraction of the disperse polymeric phrase. The discussion appears to be limited to reflective polarizers (col. 11/line 63) and reflection is still the objective (col. 10/line 59). It does not relate to voids.

The possibility of microvoiding is mentioned at col. 16/ lines 51-62 but it is only concluded that the voids may be used in conjunction with the polymeric particles, not instead of the particles, and no benefit of including them is disclosed. Moreover there is no suggestion of microvoids with the void size and frequency to get the desired transmission properties of the present invention.

At col. 2/ line 64 to col. 3/line 8, Ouderkirk et al. suggests that voids would not be useful for his optical devices because, among other reasons, "it is <u>not possible to produce a film axis for which refractive indices are relatively matched</u>" and because of the physically unstable nature of the voids. Thus the microvoided film of the present invention is neither disclosed nor suggested by Ouderkirk et al. Appendix IV provides identification of various passages of Ouderkirk that limit the teachings or teach away from the present invention.

In the Final Rejection, the Examiner relies on his reasons for rejection as stated in the Office Action of August 11, 2004 wherein Claims 1-4, 6, and 7 stand rejected under 35 USC 103(a) as being unpatentable over Ouderkirk et al.. The Examiner states that Ouderkirk et al. disclose:

> ....a light diffuser (col. 15, line 40) comprising a thermoplastic layer (col. 32, lines 62-63) containing thermoplastic polymeric material and microvoids (col. 16, lines 51-55).
>
> Ouderkirk differs from the claimed invention because he does not explicitly disclose that the thickness of the voided layer and void sizes are sufficient to provide a diffuser having a diffuse light transmission efficiency of at least 65% and a light transmission greater than 80%. However, Ouderkirk discloses a diffuse light transmission of at least efficiency of at least 65% (at least 65% of the light is diffusely transmitted; col. 32, lines 39-47, 50-53) and a light transmission of greater than 80% (at least 80%

> of the light is transmitted; col. 29, lines 8-9), depending on the thickness layer (col. 12, lines 30-33). Therefore, one of ordinary skill in the art would have recognized the utility of varying thickness of the layer to obtain a desired range of diffuse light transmission efficiency of at least 65% and a light transmission greater than 80%. Therefore, the diffuse light transmission and light transmission efficiency would be readily determined through routine optimization of thickness by one having ordinary skill in the art depending on the desired end use of the product.
> *(emphasis added)*

As explained in the Declaration of Cheryl Brickey, filed on July 1, 2005, (included in Appendix II), the Examiner is confusing terms and relying on a mere statement of numbers without regard to the actual parameter the numbers are related to. Such confusion is rendered even more likely in the case of polarized light optical elements, as in Ouderkirk. The Board is requested to consider the Brickey Declaration included as Appendix II. It attempts to remove the confusion by summarizing some basic understandings of optical terms.

The Examiner relies on col.32/ lines 39-47 and 50-53 (claims 17- 20) of Ouderkirk as disclosing the 65% light diffusion <u>efficiency</u> limitation of Claim 1. These lines of the reference deal with a <u>light transmission</u> (not efficiency) of greater than <u>70%</u>. The present claim calls for a <u>light transmission</u> of greater than <u>80%</u>. The key difference in the two is the word "efficiency" as explained in the Declaration. <u>Transmission</u> is derived from the ratio of total light <u>out</u> to total incident light or light <u>in</u>; in other words, how much of the total light incident on the diffuser at the input side is actually transmitted to the output side? On the other hand, <u>"diffuse light efficiency"</u> is derived from the ratio of diffuse light <u>out</u> to total light <u>out</u>. This measures the quantitative ability of the film to convert specular light into diffuse light. The claim calls for a 65% value for this requirement. Thus, the passages relied on by the Examiner teach neither an 80% transmission nor a 65% diffuse light efficiency.

The Examiner then relies on Ouderkirk col. 29/ lines 8-9 as disclosing the "80% transmission" claim limitation. Again, the Examiner

is not reading the passage correctly. Clearly, the passage refers to a transmission of 87.1% of the parallel state of polarization and 39.7% of the perpendicular state of polarization. Since each polarization state represents half the input light the two values must be averaged to obtain the % of the total light transmitted. Thus, the passage teaches a total light transmission of (87.1 + 39.7) / 2 = 63.4%. There is no suggestion of 80% transmission.

The Examiner relies on col 12/ lines 30-33 as suggesting that thickness can affect transmission. However, this portion of the reference is about two-phased polymeric dispersions and not about voids. Further, it does not suggest that transmissions of greater than 80% can be obtained using voided film in accordance with the invention while achieving the indicated level of efficiency..

The application contains data showing the benefit of the election of the invention in Table 1 at page 32. Appellants have prepared a slightly revised table (Table 1') containing no new information but revised and expanded to make understanding easier. The revised table is as follows:

Table 1'

Example Number	1	2	3	4	5	6	7
Type	Comp	Inv	Inv	Comp	Inv	Comp	Inv
1. Cast Layer (A) Thickness (micron)	864	838	838	838	787	737	737
2. Cast Layer (B) Thickness (micron)	25	51	51	51	102	152	152
3. Symmetric Stretching Extent	4X	3X	4X	5X	4X	3X	5X
4. Stretching Temperature (°C)	105	105	105	107	107	105	108
5. Approx. Stretched Layer (A) Thickness (micron)	54.0	93.1	52.4	33.5	49.2	81.9	29.5
6. Approx. Stretched Layer (B) Thickness (micron)	1.6	5.7	3.2	2.0	6.4	16.9	6.1

Example Number	1	2	3	4	5	6	7
7. Percent Total Transmission at 500 nm	**84.4**	73.6	**85.7**	**83.1**	71.8	47.1	68.3
8. Percent Diffuse Transmission at 500 nm	34.9	72.2	71.4	53.4	70.4	46.5	67.4
9. Percent Specular Transmission at 500 nm	49.5	1.4	14.4	29.6	1.4	0.6	0.9
9A. Diffuse Transmission Efficiency = row 8/rows 8+9	41	**98**	**83**	64	**98**	**99**	**99**
10. Percent Diffuse Reflection at 500 nm	8.7	26.0	10.8	11.9	29.4	53.9	33.4

The following changes were made to Table 1 to arrive at Table 1':
Rows numbered for discussion.

Added Row 9A calculated by simply dividing Row 8 by the sum of Rows 8 and 9 to arrive at Diffuse Light Transmission Efficiency.

Row 9A corresponds to Diffuse Light Transmission Efficiency limitation and Row 7 corresponds to the Light Transmittance limitation in claim 1.

Bold shown in Rows 7 and 9A where individual claim limitations met.

Note: Only Example 3 is inventive and meets the criteria of both Row 9A and 7 (65% and 80%) in Claim 1.

Table 1' includes row numbers for easier identification and includes a new row 9A. Row 9A shows the calculation of the diffuse light transmission efficiency for ready comparison to the 65% limitation of the claims. Together with Row 7, light transmittance, one can ascertain whether the claim limitations are met for each example. Reviewing the highlighted values, it is apparent that only Example 3 is within claim 1. It has a total transmittance value of at least 80% and a diffuse light transmission efficiency of at least 65%. Examples 2, 5, 6, and 7 are inadequate in total transmission due to the thickness in row 6 being too great.. Examples 1 and 4 have a diffuse light transmission efficiency below 65% apparently due to the thickness being too thin.

Responding to Appellants arguments, the Examiner states in his Final Rejection:

> Applicant also argues that because Ouderkirk uses a reflective polarizer, at least half of the light is reflected from Ouderkirk, and thus it cannot satisfy the light transmission efficiency of the present claims.
>
> However, as stated above, Ouderkirk teaches an optical film or other optical body which is used for reflective polarizers, but is not only for reflective polarizers; furthermore, Ouderkirk does not teach that at least half of the light is reflected.

Appellants point out that the disclosure of Ouderkirk appears to be directed to a material that is necessarily polarization sensitive and diffusely reflective of one polarization state, (birefringent according to claim 1) thus transmitting one state and reflecting the other. Appellants do not contend that at least half of the light is reflected. However, it is clearly inappropriate for the examiner to rely on a statement of % transmission that is expressly limited to one polarization state.

The Examiner further contends:

> Applicant also argues that the present invention provides a much higher total transmission, diffuse transmission and diffuse transmission efficiency than does the reflective polarizer of Ouderkirk.
>
> However, as stated above, Ouderkirk teaches an optical film or other optical body which is used for reflective polarizers, but is not only for reflective polarizers. Furthermore, Ouderkirk teaches the variation of thickness and other parameters to obtain desired transmission properties of the film (col. 12, lines 30-33) depending on the particular use of the film (film application; col. 12, line 42). <u>Therefore, one of ordinary skill in the art would have recognized the utility of varying the thickness of the layer and other parameters to obtain desired transmission properties. Therefore, the transmission properties would be readily determined through routine optimization of thickness and other parameters by one having ordinary skill in the art depending on the desired end use of the product</u>.

It seems clear that a reflective film cannot readily be made greater than 80% transmissive by routine optimization as the Examiner

suggests. There is no suggestion in Ouderkirk of a total light transmission greater than 80 % nor of a diffusion efficiency of at least 65%. Ouderkirk makes no suggestions as to suitable voided films. Ouderkirk's film is required to be reflective due to the birefringence requirement. The film of the present claims need not be birefringent and is less effective if it is because the transmission is reduced. The Examiner has not provided any teaching, disclosure or suggestion one skilled in the art to make the selection of the underlined portion above. Voids are taught as a feature to be avoided in Ouderkirk, so using voids would not have been expected from his teachings.

Even assuming *arguendo*, that the broadest teachings of Ouderkirk go beyond birefringent materials with reflective properties, Ouderkirk's discussion of sizes, thickness etc. relates to one polymeric phase in another. These statements do not relate to microvoided films and the types of microvoids to be employed. There is in Ouderkirk no discussion of microvoids in any quantitative sense of the transmission percents and diffuse efficiencies to be obtained or how to do it.

The Examiner also provides:

> In response to applicant's argument that the polarizer of Ouderkirk cannot transmit more than 50% of the incident light, it is respectfully pointed out to applicant that Ouderkirk teaches that light diffusely transmitted through the optical body (col. 34, lines 6-8) and therefore does not teach that diffusion is inconsistent with the objective of the invention.

Appellants do not mean to say that Ouderkirk cannot possibly have more than 50% total light transmission. As noted earlier, the total transmission for the Ouderkirk Example relied on by the Examiner is 63.4%; this is greater than 50% but less than the 80% limitation of the present claims. Appellants simply state that the film of Ouderkirk is said to separate two polarization states of light and reflect one in preference to the other. Light that is not reflected is diffusely transmitted. Nevertheless, each polarization state makes up 50% of the incoming light and a statement about the % transmission of only one state

is not a statement about the total transmission of light; it is just a partial statement and the numbers are only accurate when limited to that partial state. The Examiner is a trying to apply numbers applicable to only 50% of the light as if they refer to the totality of light. That is incorrect.

The Examiner also states:

> It is also pointed out to applicant that even though applicant recites that the light transmission is greater than 80%, nowhere in the claim applicant recites or suggests that the transmission is actually the total transmission of the diffuser and thus Ouderkirk disclosing transmission of 87.1% even for one state of polarization reads on the recited claim limitation. Further, a diffuser having a transmission greater than 80% is not considered a completely transmission diffuser unless the light transmission is 100%. Therefore, Ouderkirk reads on the claim limitation as the diffuser being a transmission diffuser since it transmits certain percentage of light. (*emphasis supplied)*

The Examiner is clearly distorting the meaning of % transmission when he states that it can be applied by him to only one polarization state even though the reference itself is always careful to indicate when the transmission data only applies to one polarization state to avoid any misunderstanding. Unless otherwise stated, it means total transmission.

Appellants point out that the film of the present claims is not polarization sensitive. It diffuses light without regard to it state of polarization. When one skilled in the art refers to light transmission, they mean total light unless otherwise qualified. Since the film of the present film is not polarization sensitive, it would be clearly understood to mean total light. In support, it is noted that the Example of Ouderkirk, relied on by the Examiner, where there is a polarization difference, clearly pointed out that the transmission values were for the individual polarization states and not for the total light transmission.

The burden of negating patentability is far greater than perceived by the Examiner. There is no teaching, disclosure or suggestion provided in the Ouderkirk et al. patent to employ a film having a selected thickness and voids of selected size and frequency in order to attain the transmission and diffusion

efficiency of the claims. The Examiner's logic would invalidate all selection patents and combination patents instead of employing an obviousness standard.

The Examiner's misinterpretation of Ouderkirk is not sufficient to render the rejected claims obvious. The reference requires polarization and reflection, and even if it doesn't in its broader respects, it does not suggest a diffuser selected to have the properties of the claims based on voids as opposed to two polymeric phases.

Moreover, Ouderkirk is the primary reference used in combination to arrive at rejections 2 through 4; the Examiner has not explained how or where the secondary references supply the deficiencies of Ouderkirk. The Examiner has not applied any of the rejections of paragraphs 2, 3, and 4 to claim 1. Thus, claim 1, and the claims dependent thereon, are believed to be patentable.

2. Claims 5, 15-18, and 21-22 stand rejected in Paragraph 6 of the Final Rejection under 35 U.S.C. 103(a) over Ouderkirk '543 in view of Aylward, US 6,017,686.

The deficiencies of Ouderkirk vs. claim 1 are discussed at length above. The Examiner does not allege that Aylward cures these deficiencies, and so these claims are patentable over Ouderkirk..

The Examiner seeks to find certain individual features of the invention within the Aylward reference, in particular , the nature of the voiding beads, bead particle size, average void volume, and diffuser thickness. While the Examiner attempts to find these parameters in Aylward, he makes no suggestion that they are found in a single film nor that the functional combination of the invention will result in the indicated benefits. As is shown in Table 1 of the specification at page 32, the desired transmission characteristics are not obtained except by selection of the desired combination of void variables and layer thickness. Only Sample 3 is sufficient to satisfy the claim limitations.

3. Claim 8 is Finally rejected in Paragraph 6 of the Final Rejection under 35 U.S.C. 103(a) over Ouderkirk '543 in view of Wu et al. US 5,346,954.

The deficiencies of Ouderkirk vs. claim 1 are discussed at length above. The Examiner does not allege that Wu cures these deficiencies, and so this claim is patentable over Ouderkirk..

Wu is cited for his teaching about elastic modulus. There is no suggestion in Wu as to selection of the combination of parameters including thickness and void characteristics.

4. Claim 9 is Finally rejected in Paragraph 6 of the Final Rejection under 35 U.S.C. 103(a) over Ouderkirk '543 in view of Yamamoto et al. US 5,502,011.

The deficiences of claim 1 vs. claim 1 are discussed at length above. The Examiner does not allege that Yamamoto cures these deficiencies, and so this claim is patentable over Ouderkirk.. While impact resistance is important to a "silicon nitride sintered body" it is not seen how the subject of the Yamamoto patent suggest anything about light diffusers.

Conclusion

For the above reasons, Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the Final Rejection by the Examiner and mandate the allowance of Claims 1-9 and 11-22. It is also requested that the Examiner be directed to rejoin claims 23-25 which are directed to non-elected species.

Respectfully submitted,

Attorney for Appellants
Registration No. 25,518

Arthur E. Kluegel/dlm
Telephone: 585-477-2625
Facsimile: 585-477-1148
Enclosures

If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.

Appendix I - Claims On Appeal

1. A high transmission light diffuser comprising a thermoplastic layer containing thermoplastic polymeric material and microvoids having a substantially circular cross-section in a plane perpendicular to the direction of light travel, wherein the thickness of the voided layer and void size and loading are sufficient to provide a diffuser having a diffuse light transmission efficiency of at least 65% and a light transmission greater than 80%.

2. The light diffuser of Claim 1 wherein the difference in refractive index between the thermoplastic polymeric material and the microvoids is greater than 0.2.

3. The light diffuser of Claim 1 wherein said microvoids are formed by organic microspheres.

4. The light diffuser of Claim 1 wherein said microvoids are substantially free of scattering inorganic particles.

5. The light diffuser of Claim 1 wherein the microvoids contain cross-linked polymer beads.

6. The light diffuser of Claim 1 wherein the microvoids contain a gas.

7. The diffuser of Claim 1 where thickness uniformity across the light diffuser is less than 0.10 micrometers.

8. The light diffuser of Claim 1 wherein the elastic modulus of the light diffuser is greater than 500 MPa .

9. The light diffuser of Claim 1 wherein the impact resistance of the light diffuser is greater than 0.6 GPa.

10. (Canceled)

11. The light diffuser of Claim 1 wherein said light transmission is greater than 87%.

12. The light diffuser of Claim 1 wherein said microvoids have a major axis diameter to minor axis diameter ratio of less than 2.0.

13. The light diffuser of Claim 1 wherein said microvoids have a major axis diameter to minor axis diameter ratio of between 1.6 and 1.0.

14. The light diffuser of Claim 1 wherein said thermoplastic layer contains greater than 4 index of refraction changes greater than 0.20 parallel to the direction of light travel.

15. The light diffuser of Claim 1 wherein said microvoids have a average volume of between 8 and 42 cubic micrometers over an area of 1 cm^2.

16. The light diffuser of Claim 1 wherein said microvoids have a average volume of between 12 and 18 cubic micrometers over an area of 1 cm^2.

17. The light diffuser of Claim 1 wherein the said light diffuser has a thickness less than 250 micrometers.

18. The light diffuser of Claim 1 wherein the said light diffuser has a thickness between 12.5 and 50 micrometers.

19. The light diffuser of Claim 1 wherein said thermoplastic layer comprises polyolefin polymer.

20. The light diffuser of Claim 1 wherein said thermoplastic layer comprises polyester polymer.

21. The light diffuser of Claim 5 wherein said cross linked polymer beads have a mean particle size less than 2.0 micrometers.

22. The light diffuser of Claim 5 wherein said cross linked polymer beads have a mean particle size between 0.30 and 1.7 micrometers.

Appendix II - EVIDENCE

Response under 37 C.F.R. 1.116
- Expedited Examining Procedure -
Examining Group 2871

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Customer No. 01333

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Michael R. Brickey, et al

MICROVOIDED LIGHT DIFFUSER

Serial No. 10/017,402

Filed 14 December 2001

Group Art Unit: 2871

Examiner: George Y. Wang

I hereby certify that this correspondence is being deposited today with the United States Postal Service as first class mail in an envelope addressed to Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Deidra L. Mack

Date

Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

Sir:

DECLARATION UNDER RULE 132

The undersigned, Cheryl J. Brickey (nee Kaminsky), declares that:

She is an inventor in the above-captioned patent application;

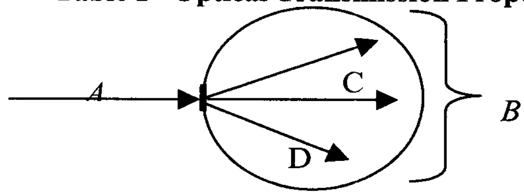
She has received the degree of B.S. in Chemical Engineering from Carnegie Mellon University;

She has been employed as a research scientist with Eastman Kodak Company since August 2000;

She has reviewed the outstanding Office Action and any applicable cited references;

As one skilled in the art, she has been asked to help clarify the technical distinctions between the terms used in the present claims and the teachings of Ouderkirk et al. This has been done by using diagrams and hypothetical optical elements, with reference to the specification where appropriate, to demonstrate the distinctions, as follows:

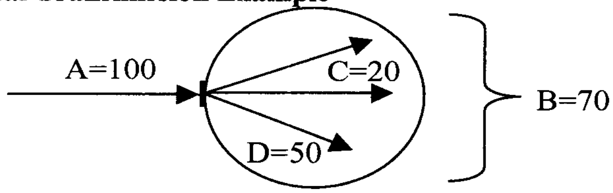
Table I - Optical Transmission Properties Defined



B=C+D

Percent total transmission	Total light exiting film / Total light entering the film ***B/A*** *"Percentage total transmitted light refers to percent of light that is transmitted though the sample at all angles." Page 27, lines 11-12.*
Percent diffuse transmission	Total light exiting diffusely / Total light entering the film D/A *"Diffuse transmittance is defined as the percent of light passing though the sample excluding a 2 degree angle from the incident light angle." Page 27 lines 12-14*
Percent specular transmission	Total light exiting specularly / Total light entering the film C/A *"specular light (within 2 degrees of incident angle of light)." Page 33, lines 14-15*
Diffuse light transmission efficiency	Total light exiting diffusely / Total light exiting the film D/B *"The term "diffuse light transmission efficiency" means the ratio of % diffuse transmitted light at 500 nm to % total transmitted light at 500 nm multiplied by a factor of 100." Page 5, lines 22-24*

Example 1 – Optical Transmission Example

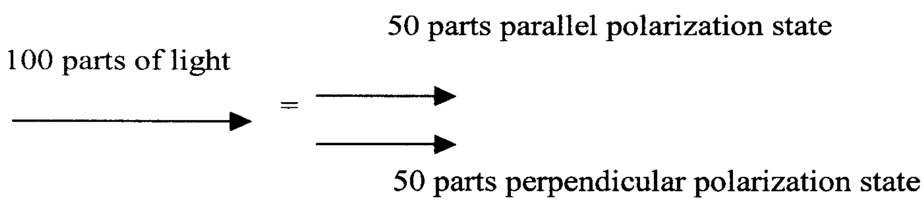


Percent total transmission	Total light exiting film / Total light entering the film B/A= 70/100 = .7 or 70%
Percent diffuse transmission	Total light exiting diffusely / Total light entering the film D/A=50/100 = .5 or 50%
Percent specular transmission	Total light exiting specularly / Total light entering the film C/A= 20/100 = 0.2 or 20%
Diffuse light transmission efficiency	Total light exiting diffusely / Total light exiting the film D/B= 50/70 = .714 or 71.4%

As one can see from the above numbers, percent diffuse transmission and diffuse light transmission efficiency are two very different numbers and cannot be compared to one another. On the other hand, when one skilled in the art uses the term "light transmission" without further limitation, it is well understood to those skilled in the art to mean the percentage total transmission.

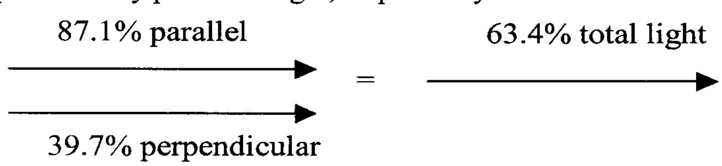
Polarized Light Measurements

Light is made up of two polarization states of light. They are referred to as p and s, or parallel and perpendicular, or 1 and 2, etc. For this explanation, we will refer to the two as para and perp. Light is typically made up of approximately equal parts perp and para polarized light.



Example 2- Polarized Light

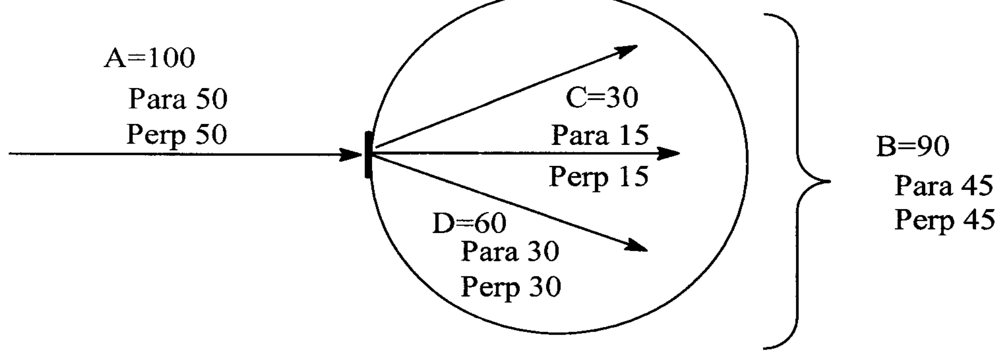
Example 101 in Ouderkirk states that the transmission was 87.1 for the parallel and 39.7% for the perpendicularly polarized light, respectively.



Based on each entering component comprising 50%, this indicates that the total transmission for example 101 in Ouderkirk is 63.4% (0.5x87.1+0.5x39.7 = 63.4%)

Example 3 - Polarization + Optical Properties

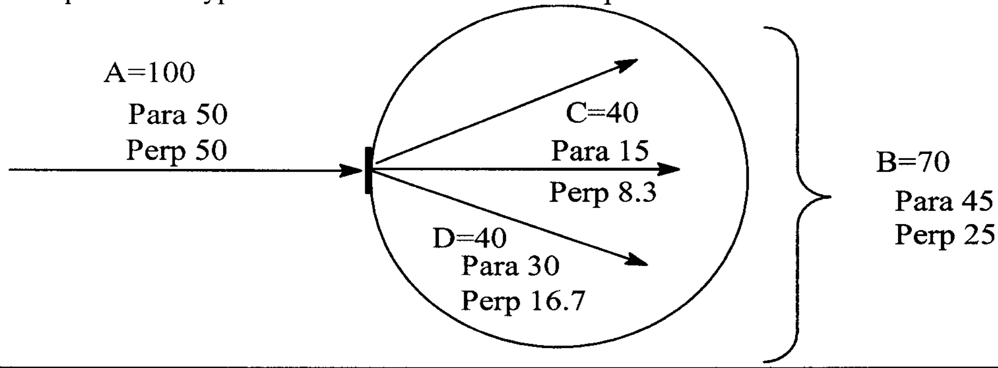
This hypothetical example is of a film that does not alter the polarization properties of the incoming light. Therefore the film transmits light of each polarizartion equally.



Percent total transmission	**Total light exiting film / Total light entering the film** B/A= 90/100 = .9 or 90%
Percent parallel transmission	*Total parallel light exiting film / Total parallel light entering film* B_{para}/A_{para} = 45/50 = .9 or 90%
Percent perpendicular transmission	*Total perpendicular light exiting film / Total perpendicular ligh entering film* B_{perp}/A_{perp} = 45/50 = .9 or 90%
Percent diffuse transmission	**Total light exiting diffusely / Total light entering the film** ***D/A=60/100 = .6 or 60%***
Percent parallel diffuse transmission	*Total parallel light exiting diffusely / Total parallel light entering film* D_{para}/A_{para} = 30/50 = .6 or 60%
Percent perpendicular diffuse transmission	*Total parallel light exiting diffusely / Total perp light entering film* D_{para}/A_{para} = 30/50 = .6 or 60%
Percent specular transmission	**Total light exiting specularly / Total light entering the film** ***C/A= 30/100 = 0.3 or 30%***
Percent parallel specular transmission	*Total parallel light exiting specularly / Total parallel light entering film* C_{para}/A_{para} = 15/50 = .3 or 30%
Percent perpendicular specular transmission	*Total parallel light exiting specularly / Total perp light entering film* C_{para}/A_{para} = 15/50 = .3 or 30%
Diffuse light transmission efficiency	**Total light exiting diffusely / Total light exiting the film** ***D/B= 60/90 = .667 or 66.7%***
Parallel diffuse light transmission efficiency	*Total para light exiting diffusely / Total para light exiting the film* ***D/B= 30/45 = .667 or 66.7%***
Perpendicular diffuse light transmission efficiency	*Total perp light exiting diffusely / Total perp light exiting the film* ***D/B= 30/45 = .667 or 66.7%***

Example 4 - Polarization + Optical Properties

This example is of a film that does alter the polarization properties of the incoming light. Therefore the film does not transmit light of each polarizartion equally. An example of this type of film would be a reflective polarizer.



Percent total transmission	**Total light exiting film / Total light entering the film** B/A= 70/100 = .7 or 70%
Percent parallel transmission	*Total parallel light exiting film / Total parallel light entering film* B_{para}/A_{para} = 45/50 = .9 or 90%
Percent perpendicular transmission	*Total perpendicular light exiting film / Total perpendicular light entering film* B_{perp}/A_{perp} = 25/50 = .5 or 50%
Percent diffuse transmission	**Total light exiting diffusely / Total light entering the film** ***D/A=40/100 = .4 or 40%***
Percent parallel diffuse transmission	*Total parallel light exiting diffusely / Total parallel light entering film* D_{para}/A_{para} = 30/50 = .6 or 60%
Percent perpendicular diffuse transmission	*Total parallel light exiting diffusely / Total perp light entering film* D_{para}/A_{para} = 16.7/50 = .334 or 33.4%
Percent specular transmission	**Total light exiting specularly / Total light entering the film** ***C/A= 40/100 = 0.4 or 40%***
Percent parallel specular transmission	*Total parallel light exiting specularly / Total parallel light entering film* C_{para}/A_{para} = 15/50 = .3 or 30%
Percent perpendicular specular transmission	*Total parallel light exiting specularly / Total perp light entering film* C_{para}/A_{para} = 8.3/50 = .167 or 16.7%
Diffuse light transmission efficiency	**Total light exiting diffusely / Total light exiting the film** ***D/B= 40/70 = .571 or 57.1%***
Parallel diffuse light transmission efficiency	*Total para light exiting diffusely / Total para light exiting the film* ***D/B= 30/45 = .667 or 66.7%***
Perpendicular diffuse light transmission efficiency	*Total perp light exiting diffusely / Total perp light exiting the film* ***D/B= 16.7/25 = .667 or 66.7%***

At page 3 of the Action, the Examiner states that Ouderkirk discloses a light diffuser where the light transmission is greater than 87% (Col 29, lines 8-9). Col 29 lines 8-9 describe the light transmission properties of Example 101 of the reference. "The transmission was 87.1% and 39.7% for parallel and perpendicular polarized light, respectively." Assuming that the entering light is ½ para and ½ perp, (there is no reason to believe otherwise) the total light transmission is:

$$\frac{87.1}{2} + \frac{39.7}{2} = 63.4$$

63.4% total transmission is much lower than Applicants' claimed ranges of greater than 80%(Claim 1) and 87% (Claim 11) total transmission. In fact, in the 124 Examples in Ouderkirk et al., there is not one example that has a higher total transmission than 75.8% (please see Appendix A for calculations on each example).

In the response to Appellants' prior arguments in Paragraph 15 of the Office Action, the Examiner states beginning at the 8th line from the bottom of page 7:

> "Furthermore, Ouderkirk clearly teaches a diffuse light transmission efficiency of at least 65% (Col 32, lines 39-41 and 50-53.)

The section the Examiner quotes reads:

> "The optical body of claim 13, wherein said optical body has a total light transmission of greater than about 70% <u>for said second polarization state</u> of electromagnetic radiation." (emphasis added)

This language in the claim of the reference is only quantifying one of the two polarization states of light meaning that the claim states that the film has at least 35% (70% / 2) total transmission. The second quoted section reads,

> "The optical body of claim 1, wherein at least about 70% of light <u>polarized orthogonal to a first polarization of light</u> is transmitted through said optical body with an angle of deflection of less than about 8°."(emphasis added)

"Light polarized orthogonal to a first polarizer of light" means light that is at a right angle or perpendicular to the first polarization state of light, also known as the second polarization state of light. Furthermore, the quoted claim also states that at least

70% of the light transmitted from this polarization state of light is transmitted with a deflection angle of less than 8 degrees and would therefore have a lower than the claimed range of greater than 65% percent diffuse transmission efficiency.

The Examiner states:

> "Even if Applicant is correct that 70% transmitted from the first state is actually 35% transmission efficiency, then it would be equally correct to say that another 35% is transmitted through the second polarization state. Therefore, Ouderkirk discloses a diffuser having 'a diffuse light transmission efficiency of at least 65%'".

Appellants respectfully disagree. Firstly, the claims that the Examiner refers to are not directed to the total light transmission percentage. Claims 13, 14, and 15 are directed towards the <u>reflectivity</u> of the first polarization state of light. Claims 13, 16, and 17 are directed towards the transmission of <u>the second polarization state</u> of light. Claims 18, 19, and 20 are directed towards the transmission of light polarized orthogonal to the first polarization state of light which is the <u>second polarization</u> state of light. Therefore, the only transmission is transmission of the second polarization state of light. Furthermore, the claims directed towards the first polarization state of light claim 50%, 60%, and 70% <u>reflectivity</u> (not transmission) corresponding to 50%, 40%, and 30% transmission of the first polarization state of light. Therefore, a film made with these disclosed ranges would <u>not</u> have a total transmission of greater than 80%.

As the advantageous effect of the invention states, Applicant's invention provides improved light transmission <u>while simultaneously diffusing specular light sources</u>. (Page 4, lines 14-16). It is easy to have a film or substrate with high transmission; (an example of this would be a clear pane of glass). The clear pane of glass has a very high level of transmission and a low level of diffusing or haze. On the other extreme, a piece of frosted glass has a very high amount of diffusing or haze and a low amount of transmission. Applicant's invention has combined transmission and diffusion to create a film with high transmission and high diffusion. Ouderkirk discloses 124 preferred embodiment examples quantifying the transmission with transmission in the perp and transmission para polarization states. Assuming that the entering light is ½ perp and ½ para, the total light transmission of the film can be calculated. For the 124 examples, the total transmission ranges from 41.3 to 75.8%. This is significantly lower than the claimed range of Applicant's invention

Further, Ouderkirk et al. discusses the scattering (or diffusing) characteristics when discussing figure 4a.

> FIG. 4a is a graph of the bidirectional scatter distribution as a function of scattered angle for an oriented film in accordance with the present invention for light polarized perpendicular to orientation direction;" (Col 3, lines 50-54). Ouderkirk goes on to describe the test method in Col 7 line 65- Col 8 line 5. Ourderkirk states that in figure 4a, "there is a significant specularly transmitted peak with a sizable component of diffusely transmitted light (scattering angle between 8 and 80 degrees) Col 8, lines 9-13.

A re-creation of figure 4a is shown in Appendix B and the same figure is shown in Appendix C with the y-axis having a linear scale. Once the y-axis scale is changed to a linear scale, one can see that almost all of the light exits the film at an angle between 0 and 8 degrees and very little light exits the film at angles from 8 to 80 degrees. The percent diffuse transmission efficiency of this film would be the area under the curve for the ranges of 8-80 degrees divided by the total area under the curve. Once can see that this is not going to be above 65% but would most likely be in the 1-10% range. Therefore, Ouderkirk et al. does not teach films having a light transmission of at least 80% and a percent diffuse transmission efficiency of 65% or greater.

Col 2 lines 61-65 of Ourderkirk et al. teach away from the microvoids having a substantially circular cross-section by stating: "The polymers are selected such that there is low adhesion between the dispersed phase and the surrounding matrix polymer, so that an elliptical void is formed around each inclusion when the film is stretched."

For Example 3, Applicants used an 838 micrometer first layer and a 51 micrometer thick second layer. The second layer was impregnated with cross-linked polystyrene 20% by weight. The resultant film was stretched 4 times its original size in both directions at 105 degrees Celsius. The resulting percent total transmission was 85.7% and the percent diffuse transmission efficiency was 71.4/85.7 = 83.3%. (page 29 line 22-page 30 line 2 and page 32 Table 1) One would need to employ routine experimentation to adjust the parameters to reach the objective total transmission and percent diffuse transmission efficiency for different polymer systems.

To summarize, Ouderkirk does not disclose a light diffuser that meets the limitations of claim 1 nor any of the other claims of the application.

The undersigned declares further that all statements made herein of the undersigned's own knowledge are true and all statements made on information and belief are believed to be true. These statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

____
Cheryl J. Brickey (nee Kaminsky)

Date: ____________________________

Encl: Appendices A, B, C

Appendix A

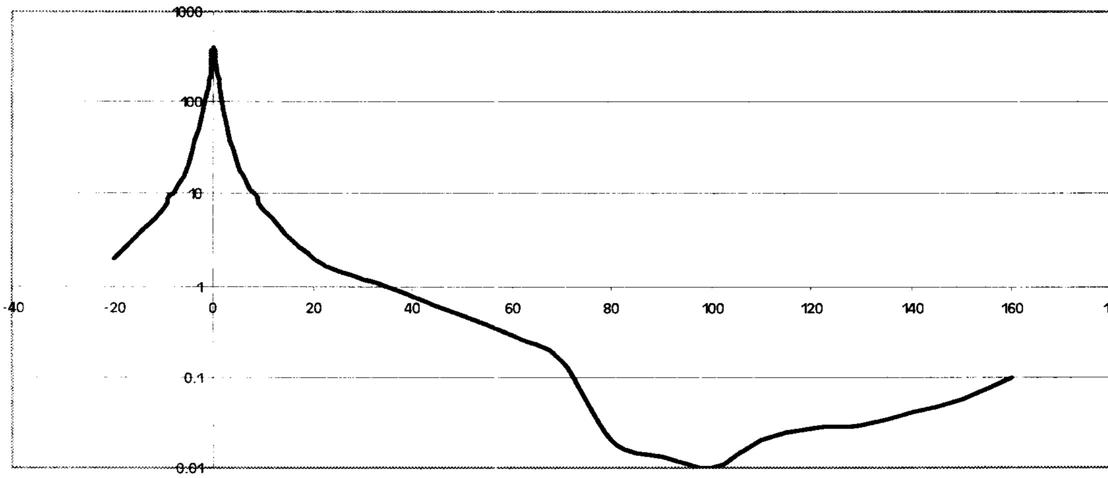
Patent Examples from Ouderkirk et al. (5,825,543)

Example	Para Refl	Perp Refl	Total Refl (calculated)	Para Trans	Perp Trans	**Total Trans (calculated)**
1	75	52	63.5			
2	73.3	35	54.15			
3	81	35.6	58.3			
4	80.1	15	47.55			
5	75.3	22.6	48.95	20.4	76.2	48.3
6	40	19.4	29.7	58.4	80.2	69.3
7	77.3	25.3	51.3	21.8	74.2	48.0
8	55.6	23.8	39.7	41	76	58.5
9	76.2	26.5	51.35	21.2	71.2	46.2
10	49.6	22.4	36	48.9	76.8	62.9
11	67	17.2	42.1	27.6	81.5	54.6
12	71.9	25	48.45	22.1	66.8	44.5
13	73.7	19.3	46.5	20.3	79.5	49.9
14	69.4	32.5	50.95	26.2	66.3	46.3
15	68.7	24.7	46.7	26.2	73	49.6
16	76.1	23.2	49.65	20.6	75.4	48.0
17	67	16.9	41.95	27.3	82.1	54.7
18	80.3	18	49.15	15	80.1	47.6
19	70.7	25.2	47.95	21.6	70.2	45.9
20	70.1	23.4	46.75	28.7	75.8	52.3
21	70.8	19.7	45.25	27.8	79.8	53.8
22	62.6	19.2	40.9	36.7	80.5	58.6
23	76.6	21.8	49.2	21.1	77.2	49.2
24	74	17.3	45.65	17.3	83.7	50.5
25	75.8	18	46.9	16	82.1	49.1
26	73.3	18	45.65	17	84.7	50.9
27	76.3	16.5	46.4	16	83	49.5
28	76	17.5	46.75	17	83.7	50.4
29	na	na	na	na	na	
30-100	no optical data given					
101				39.7	87.1	63.4
102				44.4	87.8	66.1
103				43.5	86.1	64.8
104				43.6	86.5	65.1
105				50.7	88.2	69.5
106				40.7	89.3	65.0
107				42.8	88.5	65.7
108				43.3	88.6	66.0
109				45.7	89.3	67.5
110				41.6	87.8	64.7

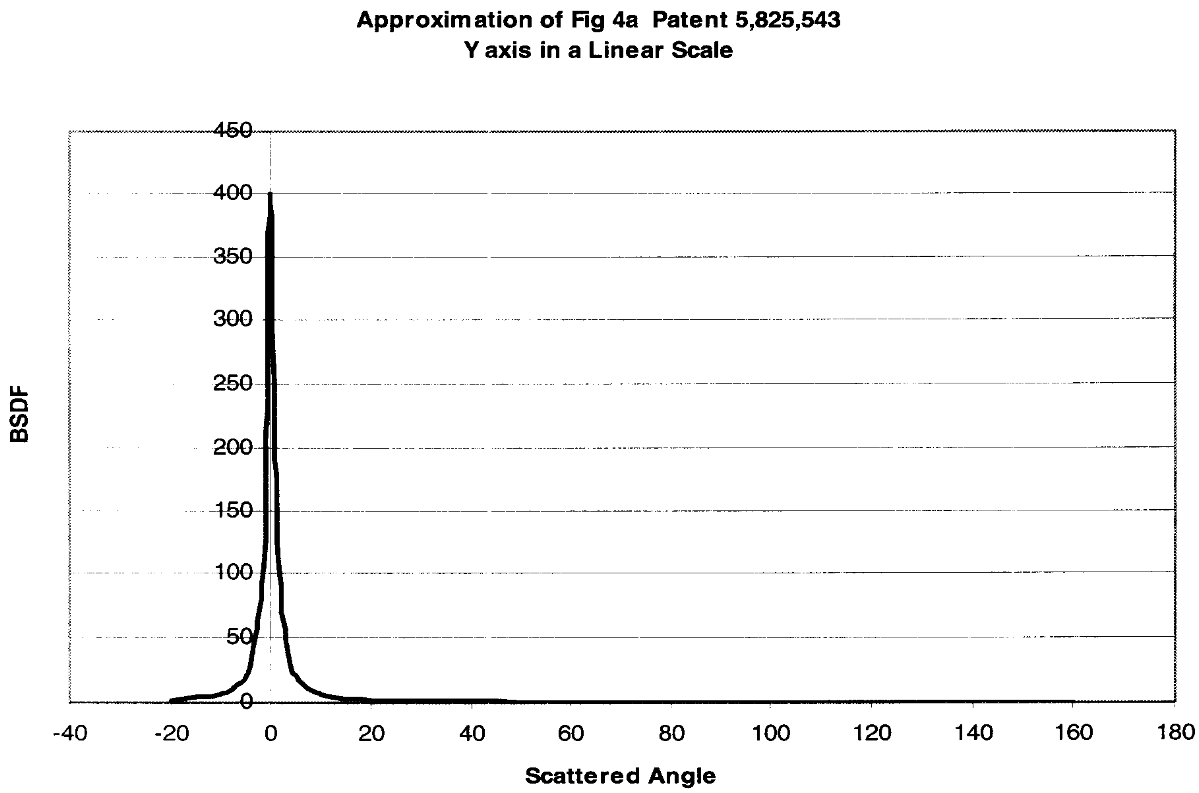
111				48.2	88.8	68.5
112				62.8	88.5	75.7
113				59.6	87.1	73.4
114				59.6	86.8	73.2
115				58.3	88	73.2
116				58.7	88	73.4
117				60.6	88.5	74.6
118				57.4	89	73.2
119				64	87.3	75.7
120				65.1	86.5	75.8
121				61.5	88.1	74.8
122				2	83	42.5
123				1.5	81	41.3
124				5	87	46.0

Appendix B

Approximation of Fig 4a, Patent 5,825,543



Appendix C



Approximation of Fig 4a Patent 5,825,543
Y axis in a Linear Scale
BSDF
450
400
350
300
250
200
150
100
50
0
-40
-20
0
20
40
60
80
100
120
140
160
180
Scattered Angle

Appendix III – Related Proceedings

None

Appendix IV – Chart of Ouderkirk Prior Art Disclosures Limiting Scope or Teaching Away

Ouderkirk et al. U.S. 5,825,543-
These disclosures are extracted from the Ouderkirk patent

A. STATEMENTS THAT LIMIT THE INVENTION OF OUDERKIRK TO REFLECTION, POLARIZATION, TWO PHASES, BIREFRINGENCE AND/OR MISMATCHED REFRACTIVE INDICES.

Column/line	Statement from US 5,825,543
C1/L7-12	This invention relates to optical materials which contain structures suitable for controlling optical characteristics, such as reflectance and transmission. In a further aspect, it relates to control of specific polarizations of reflected or transmitted light.
C2/L66 - C3/L8	The refractive index mismatch between the void and the polymer in these "microvoided" films is typically quite large (about 0.5), causing substantial diffuse reflection. However, the optical properties of microvoided materials are difficult to control because of variations of the geometry of the interfaces, and it is not possible to produce a film axis for which refractive indices are relatively matched, as would be useful for polarization-sensitive optical properties. Furthermore, the voids in such material can be easily collapsed through exposure to heat and pressure.
C3/L25-26	There thus remains a need in the art for an optical material consisting of a continuous and a dispersed phase…
C3/L63-67	In one aspect, the present invention relates to a diffusely reflective film or other optical body comprising a birefringent continuous polymeric phase and a substantially nonbirefringent disperse phase disposed within the continuous phase.
C4/L17-24	In a related aspect, the present invention relates to an optical film or other optical body comprising a birefringent continuous phase and a disperse phase, wherein the indices of refraction of the continuous and disperse phases are substantially matched (i.e., wherein the index difference between the continuous and disperse phases is less than about 0.05) along an axis perpendicular to a surface of the optical body.
C4/L25-30	In another aspect, the present invention relates to a composite optical body comprising a polymeric continuous birefringent first phase in which the disperse second phase may be birefringent, but in which the degree of match and mismatch in at least two orthogonal directions is primarily due to the birefringence of the first phase.

Column/line	Statement from US 5,825,543
C4/L48-50	In yet another aspect, the present invention relates to an optical body acting as a reflective polarizer with a high extinction ratio
C4/L58-63	In another aspect, the present invention relates to an optical body comprising a continuous phase, a disperse phase whose index of refraction differs from said continuous phase by greater than about 0.05 along a first axis and by less than about 0.05 along a second axis orthogonal to said first axis, and a dichroic dye.
C4/L12-16	These properties can be used to make optical films for a variety of uses, including low loss (significantly nonabsorbing) reflective polarizers for which polarizations of light that are not significantly transmitted are diffusely reflected.
C4/L31-32	In still another aspect, the present invention relates to a method for obtaining a diffuse reflective polarizer
C5/L1-10	In the various aspects of the present invention, the reflection and transmission properties for at least two orthogonal polarizations of incident light are determined by the selection or manipulation of various parameters, including the optical indices of the continuous and disperse phases, the size and shape of the disperse phase particles, the volume fraction of the disperse phase, the thickness of the optical body through which some fraction of the incident light is to pass, and the wavelength or wavelength band of electromagnetic radiation of interest.
C5/L51-55	In general, in the operation of this invention, the disperse phase particles should be sized less than several wavelengths of light in one or two mutually orthogonal dimensions if diffuse, rather than specular, reflection is preferred.
C6/L10-14	Within certain limits, increasing the volume fraction of the disperse phase tends to increase the amount of scattering that a light ray experiences after entering the body for both the match and mismatch directions of polarized light. This factor is important for controlling the reflection and transmission properties for a given application.

Column/line	Statement from US 5,825,543
C8/L42-48	When the material is to be used as a polarizer, it is preferably processed, as by stretching and allowing some dimensional relaxation in the cross stretch in-plane direction, so that the index of refraction difference between the continuous and disperse phases is large along a first axis in a plane parallel to a surface of the material and <u>small along the other two orthogonal axes</u>.
C8/L51-52	Some of the polarizers within the scope of the present invention are elliptical polarizers.
C8/L65-67	At an extreme, where the index of refraction of the polymers match on one axis, the elliptical polarizer will be a diffuse reflecting polarizer.
C9/L2-6	The materials selected for use in a polarizer in accordance with the present invention, and the degree of orientation of these materials, are preferably chosen so that the phases in the finished polarizer have at least one axis for which the associated indices of refraction are substantially equal.
C9/L55-56	Preferably, in applications where the optical body is to be used as a low loss reflective polarizer,
C10/L32-39	Preferably, for a low loss reflective polarizer, the preferred embodiment consists of a disperse phase disposed within the continuous phase as a series of rod-like structures which, as a consequence of orientation, have a high aspect ratio which can enhance reflection for polarizations parallel to the orientation direction by increasing the scattering strength and dispersion for that polarization relative to polarizations perpendicular to the orientation direction.
C10/L59-63	The refractive index of the medium may be chosen in consideration of the refractive indices of the disperse phase and the continuous phase so as to achieve a desired optical effect (<u>i.e., reflection or polarization along a given axis</u>).

Column/line	**Statement from US 5,825,543**
C11/L61-65	In applications where the optical body is to be used as a low loss reflective polarizer, the structures of the disperse phase preferably have a high aspect ratio, i.e., the structures are substantially larger in one dimension than in any other dimension.
C13/L21-30	Of these, 2,6-polyethylene naphthalate (PEN) is especially preferred because of its strain induced birefringence, and because of its ability to remain permanently birefringent after stretching. PEN has a refractive index for polarized incident light of 550 nm wavelength which increases after stretching when the plane of polarization is parallel to the axis of stretch from about 1.64 to as high as about 1.9, while the refractive index decreases for light polarized perpendicular to the axis of stretch. PEN exhibits a birefringence
C20/L19-24	The optical bodies of the present invention are particularly useful as diffuse polarizers. However, optical bodies may also be made in accordance with the invention which operate as reflective polarizers or diffuse mirrors.
C20/L40-42	The reflective polarizer of the present invention has many different applications, and is particularly useful in liquid crystal display panels.

B. STATEMENTS THAT TEACH AWAY FROM PRESENT INVENTION

Column/line	Statement from US 5,825,543
Title	DIFFUSELY REFLECTING POLARIZING ELEMENT INCLUDING A FIRST BIREFRINGENT PHASE AND A SECOND PHASE
Abstract	The size and shape of the disperse phase particles, the volume fraction of the disperse phase, the film thickness, and the amount of orientation are chose to attain a desired degree of diffuse reflection and total transmission of electromagnetic radiation of a desired wavelength in the resulting film.
C2/L57-C3/L8	Other optical films have been made by incorporating a dispersion of inclusions of a first polymer into a second polymer, and then stretching the resulting composite in one or two directions. U.S. Pat. No. 4,871,784 (Otonari et al.) is exemplative of this technology. The polymers are selected such that there is low adhesion between the dispersed phase and the surrounding matrix polymer, so that an elliptical void is formed around each inclusion where the film is stretched. Such voids have dimensions of the order of visible wavelengths. The refractive index mismatch between the void and the polymer in these "microvoided" films is typically quite large (about 0.5), causing substantial diffuse reflection. However, the optical properties of microvoided materials are difficult to control because of variations of the geometry of the interfaces, and it is not possible to produce a film axis for which refractive indices are relatively matched, as would be useful for polarization-sensitive optical properties. Furthermore, the voids in such material can be easily collapsed through exposure to heat and pressure.
C3/L67-C4/L5	The indices of refraction of the continuous and disperse phases are substantially mismatched (i.e., differ from one another by more than about 0.05) along a first of three mutually orthogonal axes, and are substantially matched (i.e., differ by less than about 0.05) along a second of three mutually orthogonal axes.
C5/L28-32	If the particles are too large, the light is specularly reflected from the particle surface, with very little diffusion into other directions. When the particles are too large in at least two orthogonal directions, undesirable iridescence effects can also occur.